Cosmetic Compositions

Technical Field

The present invention relates to cosmetic compositions. In particular it relates to cosmetic compositions with high moisturisation efficacy without high levels of tack. The compositions further display good in-use rub-in and absorption characteristics, as well as excellent skin feel, skin softness, and skin smoothness benefits.

Background of the Invention

Skin is made up of several layers of cells which coat and protect the keratin and collagen fibrous proteins that form the skeleton of its structure. The outermost of these layers, referred to as the stratum corneum, is known to be composed of 25nm protein bundles surrounded by 8nm thick layers. Anionic surfactants and organic solvents typically penetrate the stratum corneum membrane and, by delipidization (i.e. removal of the lipids from the stratum corneum), destroy its integrity. This destruction of the skin surface topography leads to a rough feel and may eventually permit the surfactant or solvent to interact with the keratin, creating irritation.

It is now recognised that maintaining the proper water gradient across the stratum corneum is important to its functionality. Most of this water, which is sometimes considered to be the stratum corneum's plasticizer, comes from inside the body. If the humidity is too low, such as in a cold climate, insufficient water remains in the outer layers of the stratum corneum to properly plasticize the tissue, and the skin begins to scale and becomes itchy. Skin permeability is also decreased somewhat when there is inadequate water across the stratum corneum. On the other hand, too much water on the outside of the skin causes the stratum corneum to ultimately absorb three to five times its own weight of bound water. This swells and puckers the skin and results in

approximately a two to three fold increase in the permeability of the skin to water and other polar molecules.

Thus, a need exists for compositions which will assist the stratum corneum in maintaining its barrier and water-retention functions at optimum performance in spite of deleterious interactions which the skin may encounter in washing, work, and recreation.

Desirable properties of cosmetic cream and lotion compositions are good skin feel, water retention, moisturisation, absorption, and rub-in characteristics. The skin feel of a composition, perceived by the consumer as skin softness or skin smoothness, is related to the emollients of a composition which form a film or layer upon application to the skin. The absorption and rub-in characteristics of a composition relate to its physical behaviour under mechanical stress which is affected by the rheological profile of the composition.

Many cosmetic cream and lotion compositions are known to provide varying degrees of emolliency, barrier and water-retention (moisturising) benefits. In order to deliver high moisturisation to the skin it is necessary to incorporate polyhydric alcohol-like humectant materials such as glycerine into a composition. Skin compositions with high levels of polyhydric alcohols and therefore high levels of moisturisation, however, are perceived by the consumer as unpleasant as such compositions form very sticky residues when applied to the skin.

Thus, there remains a need for compositions which show low levels of stickiness or tack whilst providing high levels of moisturisation, as well as providing excellent skin feel, skin softness and skin smoothness benefits.

WO97/27838 describes compositions comprising a polymeric film forming agent e.g. ~~polyquaternium~~ Polyquaternium-10, a hydroxy acid, a physical exfoliant and a carrier for use in improving the smoothness of skin. The incorporation of polymeric film forming agents in compositions comprising hydroxy acids is described as having an unexpected effect on the ability of the resulting compositions to increase the skin smoothness benefits.

Polymeric film forming agents such as polyquaternium-10 are described in US-A-5,103,763 as skin-feel-modifying compounds useful for skin care compositions which are resistant to removal when the skin is washed. The examples describe compositions comprising 4% glycerin and 0.2% polyquaternium-10. The compositions may further

comprise emollients in combination with cationic surfactants. In addition, US-A-4,938,951 describes compositions comprising evaporative solvents, polymeric film forming agents, and topically active agents. The compositions are described as providing an enhancement in the effective activity of a topically active agent and specifically, that the film forming polymer has an ability to enhance the effective activity of the topically active agent.

Personal cleansing compositions comprising water soluble polyols such as glycerine and cationic film forming polymers such as polyquaternium-10 are described in for example, WO96/17917 and WO96/17916. Such compositions however also comprise greater than, or equal to, 4% of anionic or amphoteric surfactants and are intended for use as a rinse off product.

It has now been unexpectedly found that by incorporating cation containing polymers into a leave-on cosmetic composition comprising efficacious levels of a polyhydric alcohol, a composition is provided with low levels of stickiness or tack. The compositions also show good absorption, insulation and water retention properties, in addition to skin feel, skin softness and skin smoothness benefits and excellent moisturisation characteristics.

Summary of the Invention

According to one aspect of the present invention there is provided a leave-on cosmetic composition suitable for topical application to the skin comprising:

a) from about 6% to from about 20% of a polyhydric alcohol, or mixtures thereof; and

b) a cation containing polymer selected from cationic, basic, amphoteric and zwitterionic polymers, or mixtures thereof;

wherein said composition comprises less than 4% of an anionic, zwitterionic or amphoteric surfactant.

The compositions of the invention display high moisturisation efficacy without the associated high levels of tack, as well as good rheological, absorption and insulation properties, in addition to skin feel, skin softness and skin smoothness benefits.

According to a second aspect of the present invention there is provided a cosmetic method of treatment of the skin comprising applying to the skin a composition according to the present invention.

According to a third aspect of the present invention there is provided a use of a cation containing polymer selected from cationic, basic, amphoteric and zwitterionic polymers, or mixtures thereof, for reducing tack in a skin care composition comprising from about 6% to from about 20% of a polyhydric alcohol, or mixtures thereof.

According to a fourth aspect of the present invention there is provided a use of a composition comprising from about 6% to from about 20% of a polyhydric alcohol, or mixtures thereof; and a cation containing polymer selected from cationic, basic, amphoteric and zwitterionic polymers, or mixtures thereof for a leave-on skin care application.

Detailed Description of the Invention

The compositions of the present invention comprise a polyhydric alcohol together with an essential cation containing polymer component, as well as various optional ingredients as indicated below. All levels and ratios are by weight of total composition, unless otherwise indicated. Chain length and degrees of ethoxylation are also specified on a weight average basis.

The term "tack" or "tackiness", as used herein, in relation to a leave-on composition means the ability of a composition to lightly bond to skin surfaces where the composition has been applied, upon the application of light pressure and within a short time-scale.

The term "stickiness" or "sticky" as used herein, is a term often used by consumers to describe their perception of the tack, either actual or perceived of a composition.

As used herein the term "leave-on" in relation to skin care compositions means that it intended to be used without a rinsing step, such that after applying the composition to the skin, the leave-on composition is preferably left on the skin for a period of at least about 15 minutes, more preferably at least about 30 minutes, even more preferably at least about 1 hour, most preferably for at least several hours, e.g., up to about 12 hours.

The term "cation containing polymer" as used herein, means a polymer having 2% or more, preferably 5% or more or more preferably 10% or more on a molar weight basis of monomers that contain cationic charge at pH 4.

The term "ampholytic" as used herein, means a polymer which comprises cationic and anionic monomers.

The term "copolymer" as used herein, means the combination of more than one chemically different monomer.

The term "zwitterionic" as used herein, means a compound which bears both positive and negative charges and exists as a dipolar ion in a wide range of pH.

The term "amphoteric" as used herein, means a compound which exhibits cationic behaviour at low pH and anionic behaviour at high pH. At intermediate pH, called the isoelectric point, the compound bears both positive and negative charges i.e. it is a dipolar ion.

The term "basic" as used herein, means a polymer which shows increasing cationic charge with decreasing pH.

The term "skin conditioning agent", as used herein means a material which is capable of providing a cosmetic conditioning benefit to the skin such as moisturization, humectancy (i.e. the ability to retain or hold water or moisture in the skin), emolliency, visual improvement of the skin surface, soothing of the skin, softening of the skin, and improvement in skin feel.

The term "non-occlusive" as used herein, means that the component as so described does not substantially or block the passage of air and moisture through the skin surface.

The present compositions can be used for any suitable purpose. In particular, the present compositions are suitable for topical application to the skin. In particular, the skin care compositions can be in the form of creams, lotions, gels, and the like. Preferably the cosmetic compositions herein are in the form of an emulsion of one or more oil phases in an aqueous continuous phase.

Polyhydric Alcohols

As an essential component, the compositions herein comprise at least one polyhydric alcohol. The compositions of the present invention preferably comprise from about 6% to

about 20%, more preferably from about 7% to about 15%, and especially from about 8% to about 12% by weight of the polyhydric alcohol, or mixtures thereof.

Suitable polyhydric alcohols for use herein include polyalkylene glycols and more preferably alkylene polyols and their derivatives, including propylene glycol, dipropylene glycol, polypropylene glycol, polyethylene glycol and derivatives thereof, sorbitol, hydroxypropyl sorbitol, erythritol, threitol, pentaerythritol, xylitol, glucitol, mannitol, hexylene glycol, butylene glycol (e.g., 1,3-butylene glycol), hexane triol (e.g., 1,2,6-hexanetriol), trimethylol propane, neopentyl glycol, glycerine, ethoxylated glycerine and propoxylated glycerine.

Preferred polyhydric alcohols of the present invention are selected from glycerine, butylene glycol, propylene glycol, dipropylene glycol, polyethylene glycol and derivatives thereof, hexane triol, ethoxylated glycerine and propoxylated glycerine, or mixtures thereof.

Most preferred polyhydric alcohols for use in the present invention are glycerine and polyethylene glycol and derivatives thereof, or mixtures thereof.

From the viewpoint of providing improved tack benefits, the weight ratio of the cation containing polymer to polyhydric alcohol is preferably in the range of from about 1:200 to about 1:1 and more preferably in the range of from about 1:100 to about 1:5.

Cation Containing Polymer

As a further essential component, the compositions herein comprise at least one cation containing polymer as hereinbefore defined selected from cationic, basic, amphoteric and zwitterionic polymers, or mixtures thereof.

The compositions of the present invention preferably comprise from about 0.01% to about 20%, more preferably from about 0.05% to about 5%, and especially from about 0.1% to about 1% by weight of the cation containing polymer, or mixtures thereof.

Preferably, the cation containing polymers herein are water soluble, dispersible or swellable. By "water swellable" is meant the ability of the cation containing polymers to increase in volume or expand in aqueous solution.

Suitable cationic polymers for compositions herein include cationic polysaccharides or derivatives thereof, cationic homo or copolymers of dimethyldiallylammonium chloride, cationic copolymers comprising vinylpyrrolidone; cationic copolymers comprising acrylic acid or derivatives thereof, cationic homo or copolymers of ethanaminium, N,N,N-trimethyl-2-[(2-methyl-1-oxo-2-propenyl)oxy]-,chloride, Polyquaternium-2 and quaternised chitosan, or mixtures thereof. Preferred cation containing polymer for compositions herein are cationic polysaccharides or derivatives thereof.

Suitable non-limiting examples of cationic polysaccharides include the following: cellulose; hydroxyalkylcelluloses e.g. hydroxyethyl cellulose; cationic cellulosic derivatives having a molecular weight in the range of from 120,000 to 2,000,000, involving quaternary ammonium groupings, such as, for example a polymeric quaternary ammonium salt of hydroxyethyl cellulose reacted with a trimethyl ammonium subsitituted epoxide, more specifically, cellulose ω-ether modified with α-[2-hydroxy-3-trimethylammonio)propyl]-ω-hydroxypoly(oxy-1, 2-ethanediyl)chloride, known in the industry under the (CTFA) trade designation Polyquaternium-10, commercially available from Union Carbide Corporation (Danbury, Conn., USA) as "JR" and "LR" e.g. "JR-125", "JR-400", "JR-30M", "LR-500", diallyl dimethyl ammonium chloride/hydroxyethyl cellulose copolymers, referred to in the industry (CTFA) as Polyquaternium-4, available under the trade names "Celquat L 200" or "Celquat H-100" from the National Starch Company (Salisbury, NC, USA) and polymeric quaternary ammonium salts of hydroxyethyl cellulose reacted with a lauryl dimethyl ammonium substituted epoxide "Quatrisoft Polymer LM-200", referred to in the industry as Polyquaternium-24, available from Amerchol Corp. (Edison, NJ, USA); starches for example, cationic starches such as, 2-hydroxy-3-trimethyl ammonium chloride propyl ether of starch, commercially available under the trade name "Sta-Loc 300" and "Sta-Loc 400" from Staley Inc. (Decateur, Ill., USA) which has been reacted with quaternary amines to form ethers at a hydroxyl position, hydroxyalkylstarches, polymers based on arabinose monomers, polymers derived from xylose, polymers derived from fucose, polymers derived from fructose, polymers

based on acid-containing sugars such as galacturonic acid and glucuronic acid, polymers based on amine sugars such as galactosamine and glucosamine particularly acetylglucosamine, polymers based on 5 or 6 membered ring polyalcohols, polymers based on galactose, and polymers based on mannose monomers.

Suitable cationic polysaccharide gum derivatives include derivatives of polymers based on galactomannan copolymer known as guar gum. For example, compounds such as hydroxypropyl guar gums, commercially available under the trade name "Jaguar HP-60", "Jaguar HP-8", "Jaguar HP-79", "Jaguar HP-120", "Jaguar HP-200", from Rhône-Poulenc or "Galactasol" available from Aqualon; hydroxypropyl guar hydroxypropyltrimonium chloride commercially available under the trade name "Jaguar C-162" from Rhône-Poulenc; or polymeric compounds such as guar hydroxypropyltrimonium chloride, commercially available for example under the trade name "Jaguar C-14S", "Jaguar C-17", "Jaguar C-13S" from Rhône-Poulenc, "N-Hance" e.g. "N-Hance 2196" from Aqualon, Hercules Inc., (Zwijndrecht, The Netherlands), or "Cosmedia Guar C-261" from Henkel Inc (Teaneck, NJ, USA).

Suitable cationic homo or copolymers of dimethyldiallylammonium chloride for use herein are poly(dimethyldiallylammonium chloride) commercially available under the trade designation Polyquaternium-6 or trade names "Merquat 100" from Calgon (Pittsburg, PA, USA), "Agequat 400" from CPS Chemical Company (West Memphis, AR, USA), or "Mirapol 100" from Rhône-Poulenc; and the polymeric quaternary ammonium salt consisting of acrylamide and dimethyl diallyl ammonium chloride monomers commercially available under the trade designation Polyquaternium-7 or trade names "Merquat 550" from Calgon (Pittsburg, PA, USA).

Suitable cationic copolymers comprising vinylpyrrolidone for use herein include the polyvinylpyrrolidone N,N-dimethyl aminoethyl methacrylic acid copolymer diethyl sulfate solution commercially available under the trade designation Polyquaternium-11 or trade name "Gafquat 755N" from ISP (Wayne, NJ, USA); the polymeric quaternary ammonium salt formed from methylvinylimidazolium chloride and vinylpyrrolidone commercially available under the trade designation Polyquaternium-16 or trade name "Luviquat FC 370" from BASF (Parsippany, NJ, USA); the vinylpyrrolidone/methacrylamidopropyltrimethylammonium chloride copolymer

commercially available under the trade designation Polyquaternium-28 or trade name "Gafquat HS-100" from ISP (Wayne, NJ, USA); the polymeric quaternary ammonium salt consisting of vinylpyrrolidone and quaternised imidazoline monomers commercially available under the trade designation Polyquaternium-44 or trade name "Luviquat MS-370" from BASF (Parsippany, NJ, USA); and the quaternary ammonium salt prepared by the reaction of vinylcaprolactam and vinylpyrrolidone with methylvinylimidazolium methosulfate commercially available under the trade designation Polyquaternium-46 or trade name "Luviquat Hold" from BASF (Parsippany, NJ, USA).

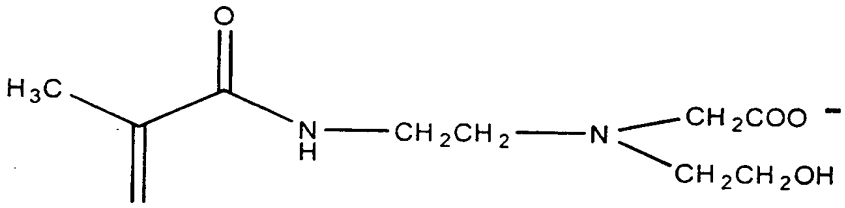
Suitable cationic copolymers comprising acrylic acid or derivatives thereof include the polymeric quaternary ammonium salt prepared by the reaction of ethylmethacrylate/abietylmethacrylate/diethylaminoethyl methacrylate copolymer with dimethyl sulfate commercially available under the trade designation Polyquaternium-12; the polymeric material; and the copolymer of acrylamide, acrylamidopropyltrimonium chloride, 2-amidopropylacrylamide sulfonate and DMAPA monomers commercially available under the trade designation Polyquaternium-43 or trade name "Bozequat 4000" from Societe Francaise Hoescht.

Suitable cationic homo or copolymers of ethanaminium, N,N,N-trimethyl-2-[(2-methyl-1-oxo-2-propenyl)oxy]-,chloride, useful herein are the polymeric material commercially available under the trade designation Polyquaternium-45 or trade name "Plex 3073L" from Rohm GmbH (Germany); the polymeric material, ethanaminium, N,N,N-trimethyl-2-[(2-methyl-1-oxo-2-propenyl)oxy]-,chloride, polymer with 2-propenamide commercially available under the trade designation Polyquaternium-32 or trade name "Salcare SC92" from Allied Colloids (Bradford, N.Yorkshire, UK); and the polymeric material, ethanaminium, N,N,N-trimethyl-2-[(2-methyl-1-oxo-2-propenyl)oxy]-,chloride, homopolymer commercially available under the trade designation Polyquaternium-37 or trade name "Salcare SC95" from Allied Colloids (Bradford, N.Yorkshire, UK).

Other suitable cationic polymers useful herein are poly(oxy-1,2-ethanediyl)(dimethyliminio)-1,3-propanediylimino carbonyl-imino-1,2-propanediyl(-dimethyliminio)-1,2-ethanediyl dichloride known in the industry as Polyquaternium-2 and commercially available under the trade name Mirapol A-15 from Rhône-Poulenc; and

dihydroxypropyl chitosan trimonium chloride commercially available under the trade designation Polyquaternium-29 or trade name Kytamer KC from Amerchol.

Suitable amphoteric polymers for the compositions herein include combinations of tertiary amine monomers combined with anionic monomers and may further include non-ionic monomers, for example, a methacrylamidopropyldimethyl ammonium/acrylic acid copolymer; and polymers derived from methacrylamidoethylcarboxymethylhydroxyethyl amine monomers as shown below:



Suitable basic polymers for the compositions herein include include homopolymers of tertiary amine derivatives and copolymers with non-ionic monomers. Examples of suitable materials include the polyvinylpyrrolidone/dimethylaminoethylmethacrylate copolymer prepared from vinylpyrrolidone and dimethylaminoethylmethacrylate monomers commercially available under the trade designation PVP/Dimethylaminoethylmethacrylate copolymer or trade name "Copolymer 845/937/958" from ISP (Wayne, NJ, USA); Amine derived polymers such as ethyleneimine polymers which conform to the general formula $(CH_2CH_2NH)_n$; such as PEI-10 where n has an average value of 10, commercially available under the trade name "Polymin FG" from BASF; PEI-15 where n has an average value of 15, commercially available under the trade name "Epomin SP-006" from Aceto; PEI-45 where n has an average value of 45, commercially available under the trade name "Epomin SP-018" from Aceto; or PEI-1400 where n has an average value of 1400, commercially available under the tradename "Nalco 634" from Nalco.

Suitable zwitterionic polymers for the compositions herein include polymers derived from a methacrylamidopropylbetaine monomer such as a copolymer of methacrylamidopropylbetaine and a non-ionic monomer. An example of such a polymer is a copolymer of vinylpyrrolidone/methacrylamidopropylbetaine.

Preferred cation containing polymers for compositions herein are cationic polymers. Preferred cationic polymers for use herein are cationic polysaccharides or derivatives thereof selected from cationic cellulosic derivatives, cationic polysaccharide gum derivatives, or mixtures thereof. Most preferred cationic polymeric film forming materials of the compositions of the present invention are selected from polyquaternium-10, guar hydroxypropyltrimonium chloride, hydroxypropyl guar gums, or mixtures thereof. Even most preferred for use in the present invention is polyquaternium-10.

Preferably, the compositions of the present invention comprise less than 4% of an anionic surfactant, zwitterionic or amphoteric surfactant, more preferably less than 2% and most preferably less than 1% of an anionic surfactant, zwitterionic or amphoteric surfactant .

In a preferred embodiment, when the compositions of the present invention comprise an anionic surfactant, the composition has a ratio of cation containing polymer to anionic surfactant of greater than 1.

In a further preferred embodiment, the compositions herein may comprise from about 0% to about 2%, and more preferably from about 0.01% to about 1% of a C_8 to C_{30} fatty acid.

Polymeric Thickening Agents

In a further preferred embodiment, the compositions of the present invention comprise at least one polymeric thickening agent.

The polymeric thickening agents useful herein preferably have a number average molecular weight of greater than 20,000, more preferably greater than 50,000 and especially greater than 100,000.

When employing polymeric thickening agents in compositions herein, monovalent to multivalent metal ion levels should preferably less than 1%, more preferably less than 0.25% and even more preferably less than 0.05% so as not to unduly interfere with the stability of the polymers.

In general, the compositions of the present invention comprise from about 0.01% to about 10%, preferably from about 0.1% to about 8% and most preferably from about 0.5% to

about 5% by weight of the composition of the polymeric thickening agent, or mixtures thereof.

Without being limited by theory, it is thought that in compositions comprising polyol like humectants and polymeric thickening agents, a physical association of the polyol like humectant with any polymeric thickening agents present in the composition may occur. This physical association between the polyol like humectant and the polymeric thickening agents may further exacerbate the stickiness already displayed in compositions comprising high levels of polyol like humectants alone.

Preferred polymer thickening agents for use herein include non-ionic thickening agents and anionic thickening agents, or mixtures thereof. Suitable non-ionic thickening agents include polyacrylamide polymers, crosslinked poly(N-vinylpyrrolidones), polysaccharides, natural or synthetic gums, polyvinylpyrrolidone, and polyvinylalcohol. Suitable anionic thickening agents include acrylic acid/ethyl acrylate copolymers, carboxyvinyl polymers and crosslinked copolymers of alkyl vinyl ethers and maleic anhydride. Particularly preferred thickening agents for use herein are the non-ionic polyacrylamide polymers, and acrylic acid/ethyl acrylate copolymers, or mixtures thereof. Most preferred for use herein are the non-ionic polyacrylamide polymers.

Polyacrylamide Polymers The non-ionic polyacrylamide polymers useful herein are substituted polyacrylamides, branched or unbranched. These polymers are non-ionic water dispersible polymers which can be formed from a variety of monomers including acrylamide and methacrylamide which are unsubstituted or substituted with one or two alkyl groups (preferably C_1-C_5). Preferred are acrylate amides and methacrylate amides in which the amide nitrogen is unsubstituted, or substituted with one or two C_1-C_5 alkyl groups (preferably: methyl, ethyl or propyl), for example, acrylamide, methacrylamide, N-methacrylamide, N-methylmethacrylamide, N,N-dimethylmethacrylamide and N,N-dimethylacrylamide. These monomers are generally disclosed in US Pat. No. 4,963,348 to Bolich, Jr. et al., issued Oct, 16., 1990, incorporated by reference herein. These copolymers may optionally be formed using conventional neutral crosslinking agents such as dialkenyl compounds. The use of such crosslinking agents for cationic polymers is disclosed in US Pat. No. 4,628,078 to Glover et al. issued Dec. 9, 1986 and US Pat. No. 4,599,379 to Flesher et al. issued Jul. 8, 1986 both of which are incorporated by reference

herein. These non-ionic co-polymers have a molecular weight greater than about 1,000,000 preferably greater than about 1,500,000 and range up to about 30,000,000. Preferably as a result of being synthesised by reverse phase emulsion polymerisation, these non-ionic polyacrylamides are predispersed in a water-immiscible solvent such as mineral oil and the like, containing a high HLB surfactant (HLB from about 7 to about 10) which helps to facilitate water dispersibility of the polyacrylamide. Most preferred for use herein is the non-ionic polymer under the CTFA designation: polyacrylamide and isoparaffin and laureth-7, available under the trade name Sepigel 305 from Seppic Corporation.

Other polyacrylamide polymers useful herein include multi-block copolymers of acrylamides and substituted acrylamides with acrylic acids and substituted acrylic acids. Commercially available examples of these multi-block copolymers include Hypan SR150H, SS500V, SS500W, SSSA100H, from Lipo Chemicals, Inc., (Patterson, NJ).

Crosslinked poly(N-vinylpyrrolidones) Crosslinked polyvinyl(N-pyrrolidones) useful herein include those described in U.S. Patent No. 5,139,770, to Shih et al, issued August 18, 1992, and U.S. Patent No. 5,073,614, to Shih et al., issued December 17, 1991. These gelling agents typically contain from about 0.25% to about 1% by weight of a crosslinking agent selected from the group consisting of divinyl ethers and diallyl ethers of terminal diols containing from about 2 to about 12 carbon atoms, divinyl ethers and diallyl ethers of polyethylene glycols containing from about 2 to about 600 units, dienes having from about 6 to about 20 carbon atoms, divinyl benzene, vinyl and allyl ethers of pentaerythritol, and the like. Typically, these gelling agents have a viscosity from about 25,000 mPa.s (cps) to about 40,000 mPa.s (cps) when measured as a 5% aqueous solution at 25°C using a Brookfield RVT viscometer with Spindle #6 at 10 rpm. Commercially available examples of these polymers include ACP-1120, ACP-1179, and ACP-1180, available from International Speciality Products (Wayne, NJ).

Polysaccharides A wide variety of polysaccharides are suitable for use herein. By "polysaccharides" are meant gelling agents containing a backbone of repeating sugar (i.e. carbohydrate) units. Non-limiting examples of polysaccharide gelling agents include those selected from the group consisting of cellulose, carboxymethyl

hydroxyethylcellulose, cellulose acetate propionate carboxylate, hydroxyethylcellulose, hydroxyethyl ethylcellulose, hydroxypropylcellulose, hydroxypropyl methylcellulose, methyl hydroxyethylcellulose, microcrystalline cellulose, sodium cellulose sulfate, and mixtures thereof. Also useful herein are the alkyl substituted celluloses. In these polymers, the hydroxy groups of the cellulose polymer is hydroyxalkylated (preferably hydroxyethylated or hydroxypropylated) to form a hydroxyalkylated cellulose which is then further modified with a C10-C30 straight chain or branched chain alkyl group through an ether linkage. Typically these polymers are ethers of C10-C30 straight or branched chain alcohols with hydroxyalkylcelluloses. Examples of alkyl groups useful herein include those selected from the group consisting of stearyl, isostearyl, lauryl, myristyl, cetyl, isocetyl, cocoyl (i.e. alkyl groups derived from the alcohols of coconut oil), palmityl, oleyl, linoleyl, linolenyl, ricinoleyl, behenyl, and mixtures thereof. For those materials based on hydroxyethylcellulose, the hydroxyethyl molar substitution is greater than 3.0. Preferred among the alkyl hydroxyalkyl cellulose ethers is the material given the CTFA designation cetyl hydroxyethylcellulose, which is the ether of cetyl alcohol and hydroxyethylcellulose. This material is sold under the tradename Natrosol® CS Plus from Aqualon Corporation.

Other useful polysaccharides include scleroglucans comprising a linear chain of (1->3) linked glucose units with a (1->6) linked glucose every three units, a commercially available example of which is Clearogel™ CS11 from Michel Mercier Products Inc. (Mountainside, NJ).

Gums Other thickening agents useful herein include materials selected from acacia, agar, algin, alginic acid, ammonium alginate, amylopectin, calcium alginate, calcium carrageenan, carnitine, carrageenan, dextrin, gelatin, gellan gum, hectorite, hyaluroinic acid, hydrated silica, hydroxypropyl chitosan, karaya gum, kelp, locust bean gum, natto gum, potassium alginate, potassium carrageenan, propylene glycol alginate, sclerotium gum, sodium carboxymethyl dextran, sodium carrageenan, tragacanth gum, xanthan gum, and mixtures thereof.

Also useful are acrylic acid/ethyl acrylate copolymers and the carboxyvinyl polymers sold by the B.F. Goodrich Company under the trade mark of Carbopol resins. Suitable Carbopol resins are described in WO98/22085.

Crosslinked copolymers of alkyl vinyl ethers and maleic anhydride In these copolymers the vinyl ethers are represented by the formula R-O-CH=CH_2 wherein R is a C1-C6 alkyl group, preferably R is methyl. Preferred crosslinking agents are C4-C20 dienes, preferably C6 to C16 dienes, and most preferably C8 to C12 dienes. A particularly preferred copolymer is one formed from methyl vinyl ether and maleic anhydride wherein the copolymer has been crosslinked with decadiene, and wherein the polymer when diluted as a 0.5% aqueous solution at pH 7 at 25°C has a viscosity of 50,000-70,000 mPa.s (cps) when measured using a Brookfield RTV viscometer, spindle #7 at 10 rpm. This copolymer has the CTFA designation PVM/MA decadiene crosspolymer and is commercially available as Stabileze^{TM} 06 from International Specialty Products (Wayne NJ).

Oil Phase

Preferably the cosmetic compositions herein are in the form of an emulsion of one or more oil phases in an aqueous continuous phase, each oil phase comprises a single oily component or a mixture of oily components in miscible or homogeneous form. Different oil phases contain different materials or combinations of materials from each other. The total level of oil phase components in the compositions of the invention is typically from about 0.1% to about 60%, preferably from about 1% to about 30%, more preferably from about 1% to about 10% and most preferably from 1.3% to 8%.

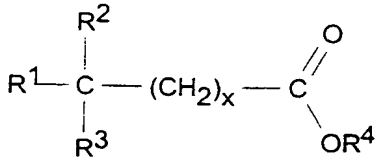
Preferably, the oil phase components of the compositions herein comprise an emollient material or mixtures thereof, a polyol carboxylic acid ester and a silicone oil, or mixtures thereof.

In preferred embodiments, the oil phase preferably comprises additional oily components such as a natural or synthetic oils selected from mineral, vegetable, and animal oils, fats and waxes, fatty acid esters, fatty alcohols, fatty acids and mixtures thereof. These oily components are present in an amount of from about 0.1% to about 15%, more preferably from about 1% to about 10% by weight of composition. Preferred for use herein are for

example, saturated and unsaturated fatty alcohols such as behenyl alcohol, cetyl alcohol and stearyl alcohol and hydrocarbons such as mineral oils or petrolatum. Further examples suitable for use herein are disclosed in WO98/22085. Preferred embodiments herein comprise from about 0.1% to about 10% by weight of an unsaturated fatty acid or ester as described in WO98/22085.

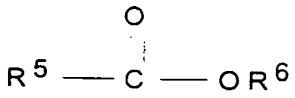
Emollient materials

The compositions of the present invention can comprise emollient materials selected from branched chain hydrocarbons having an weight average molecular weight of from about 100 to about 15,000, preferably from about 100 to 1000; compounds of formula I:



Formula I

wherein R^1 is selected from H or CH_3, R^2, R^3 and R^4 are independently selected from C_1-C_{20} straight chain or branched chain alkyl, and x is an integer of from 1-20; and compounds having the formula (II):



Formula II

wherein R^5 is selected from optionally hydroxy or C_1-C_4 alkyl substituted benzyl and R_6 is selected from C_1-C_{20} branched or straight chain alkyl; and mixtures thereof.

Suitable branched chain hydrocarbons for use herein are selected from isododecane, isohexadecane, isoeicosane, isooctahexacontane, isohexapentacontahectane, isopentacontaoctactane, and mixture thereof. Suitable for use herein are branched chain aliphatic hydrocarbons sold under the trade name Permethyl (RTM) and commercially available from Presperse Inc., P.O. Box 735, South Plainfield, N.J. 07080, U.S.A. Suitable ester emollient materials of Formula I above include, but are not limited to, methyl isostearate, isopropyl isostearate, isostearyl neopentanoate. isononyl isononanoate,

isodecyl octanoate, isodecyl isononanoate, tridecyl isononanoate, myristyl octanoate, octyl pelargonate, octyl isononanoate, myristyl myristate, myristyl neopentanoate, myristyl octanoate, myristyl propionate, isopropyl myristate and mixtures thereof. Suitable ester emollient materials of Formula (II) include but are not limited to C12-15 alkyl benzoates.

Preferred emollients for use herein are isohexadecane, isooctacontane, isononyl isononanoate, isodecyl octanoate, isodecyl isononanoate, tridecyl isononanoate, myristyl octanoate, octyl isononanoate, myristyl myristate, methyl isostearate, isopropyl isostearate, C12-15 alkyl benzoates and mixtures thereof.

Particularly preferred emollients for use herein are isohexadecane, isononyl isononanoate, methyl isostearate, isopropyl isostearate, or mixtures thereof.

The emollient material is preferably present in the compositions at a level of from about 0.1% to about 10%, preferably from about 0.1% to about 8%, especially from about 0.5% to about 5% by weight of composition.

Polyol carboxylic acid ester

The compositions of the present invention may further comprise as an additional emollient, a polyol carboxylic acid ester.

The compositions of the present invention preferably comprise from about 0.01% to about 20%, more preferably from about 0.1% to about 15%, and especially from about 0.1% to about 10% by weight of the polyol ester. The level of polyol ester by weight of the oil in the composition is preferably from about 1% to about 30%, more preferably from about 5% to about 20%. From the viewpoint of providing improved skin softness and smoothness benefits, the weight ratio of the carboxylic acid polyol ester to the emollient material is preferably in the range of from about 5:1 to about 1:5, more preferably in the range of from 2:1 to about 1:2.

The preferred polyol polyesters useful in this invention are C_1-C_{30} mono- and poly-esters of sugars and related materials. These esters are derived from a sugar or polyol moiety and one or more carboxylic acid moieties. Depending on the constituent acid and sugar, these esters can be in either liquid or solid form at room temperature. Examples include: glucose tetraoleate, the galactose tetraesters of oleic acid, the sorbitol tetraoleate,

sucrose tetraoleate, sucrose pentaoleate, sucrose hexaoleate, sucrose heptaoleate, sucrose octaoleate, sorbitol hexaester in which the carboxylic acid ester moieties are palmitoleate and arachidate in a 1:2 molar ratio, and the octaester of sucrose wherein the esterifying carboxylic acid moieties are laurate, linoleate and behenate in a 1:3:4 molar ratio. Other materials include cottonseed oil or soybean oil fatty acid esters of sucrose. Other examples of such materials are described in WO 96/16636, incorporated by reference herein. A particularly preferred material is known by the INCI name sucrose polycottonseedate.

Silicone Oil

The present compositions preferably comprise, at least one silicone oil phase. Silicone oil phase(s) generally comprises from about 0.1% to about 20%, preferably from about 0.5% to about 10%, more preferably from about 0.5% to about 5%, of the composition. The, or each, silicone oil phase preferably comprises one or more silicone components.

Silicone components can be fluids, including straight chain, branched and cyclic silicones. Suitable silicone fluids useful herein include silicones inclusive of polyalkyl siloxane fluids, polyaryl siloxane fluids, cyclic and linear polyalkylsiloxanes, polyalkoxylated silicones, amino and quaternary ammonium modified silicones, polyalkylaryl siloxanes or a polyether siloxane copolymer and mixtures thereof. The silicone fluids can be volatile or non-volatile. Silicone fluids generally have a weight average molecular weight of less than about 200,000. Suitable silicone fluids have a molecular weight of about 100,000 or less, preferably about 50,000 or less, most preferably about 10,000 or less. Preferably the silicone fluid is selected from silicone fluids having a weight average molecular weight in the range from about 100 to about 50,000 and preferably from about 200 to about 40,000. Typically, silicone fluids have a viscosity ranging from about 0.65 to about 600,000 $mm^2.s^{-1}$, preferably from about 0.65 to about 10,000 $mm^2.s^{-1}$ at 25°C. The viscosity can be measured by means of a glass capillary viscometer as set forth in Dow Corning Corporate Test Method CTM0004, July 29, 1970. Suitable polydimethyl siloxanes that can be used herein include those available, for example, from the General Electric Company as the SF and Viscasil (RTM) series and from Dow Corning as the Dow Corning 200 series. Also useful are essentially non-volatile polyalkylarylsiloxanes, for

example, polymethylphenylsiloxanes, having viscosities of about 0.65 to 30,000 $mm^2.s^{-1}$ at 25°C. These siloxanes are available, for example, from the General Electric Company as SF 1075 methyl phenyl fluid or from Dow Corning as 556 Cosmetic Grade Fluid. Cyclic polydimethylsiloxanes suitable for use herein are those having a ring structure incorporating from about 3 to about 7 $(CH_3)_2SiO$ moieties.

In preferred embodiments, the silicone fluid is selected from dimethicone, decamethylcyclopentasiloxane, octamethylcyclotetrasiloxane, phenyl methicone, and mixtures thereof.

Silicone gums can also be used herein. The term "silicone gum" herein means high molecular weight silicones having a weight average molecular weight in excess of about 200,000 and preferably from about 200,000 to about 4,000,000. Iincluded are non-volatile polyalkyl and polyaryl siloxane gums. In preferred embodiments, a silicone oil phase comprises a silicone gum or a mixture of silicones including the silicone gum. Typically, silicone gums have a viscosity at 25°C in excess of about 1,000,000 mm^2s^{-1}. The silicone gums include dimethicones as described by Petrarch and others including US-A-4,152,416, May 1, 1979 to Spitzer, et al, and Noll, Walter, Chemistry and Technology of Silicones, New York: Academic Press 1968. Also describing silicone gums are General Electric Silicone Rubber Product Data Sheets SE 30, SE 33, SE 54 and SE 76. Specific examples of silicone gums include polydimethylsiloxane, (polydimethylsiloxane)(methylvinylsiloxane) copolymer, poly(dimethylsiloxane)-(diphenyl)(methylvinylsiloxane) copolymer and mixtures thereof. Preferred silicone gums for use herein are silicone gums having a molecular weight of from about 200,000 to about 4,000,000 selected from dimethiconol, and dimethicone and mixtures thereof.

A silicone phase herein preferably comprises a silicone gum incorporated into the composition as part of a silicone gum-fluid blend. When the silicone gum is incorporated as part of a silicone gum-fluid blend, the silicone gum preferably constitutes from about 5% to about 40%, especially from about 10% to 20% by weight of the silicone gum-fluid blend. Suitable silicone gum-fluid blends herein are mixtures consisting essentially of:

(i) a silicone having a molecular weight of from about 200,000 to about 4,000,000 selected from dimethiconol, fluorosilicone and dimethicone and mixtures thereof; and

(ii) a carrier which is a silicone fluid, the carrier having a viscosity from about 0.65 $mm^2.s^{-1}$ to about 100 $mm^2.s^{-1}$,

wherein the ratio of i) to ii) is from about 10:90 to about 20:80 and wherein said silicone gum-based component has a final viscosity of from about 100 $mm^2.s^{-1}$ to about 100,000 $mm^2.s^{-1}$, preferably from 500 $mm^2.s^{-1}$ to about 10,000 $mm^2.s^{-1}$.

An especially preferred silicone-gum fluid blend based component for use in the compositions herein is a dimethiconol gum having a molecular weight of from about 200,000 to about 4,000,000 along with a silicone fluid carrier with a viscosity of about 0.65 to 100 $mm^2.s^{-1}$. An example of this silicone component is Dow Corning Q2-1403 (85% 5 $mm^2.s^{-1}$ Dimethicone Fluid/15% Dimethiconol) and Dow Corning Q2-1401 available from Dow Corning.

Further silicone components suitable for use in a silicone oil phase herein are crosslinked polyorganosiloxane polymers, optionally dispersed in a fluid carrier. In general, when present the crosslinked polyorganosiloxane polymers, together with its carrier (if present) comprises 0.1% to about 20%, preferably from about 0.5% to about 10%, more preferably from about 0.5% to about 5% of the composition. Such polymers comprise polyorganosiloxane polymers crosslinked by a crosslinking agent. Suitable crosslinking agents are disclosed in WO98/22085. Examples of suitable polyorganosiloxane polymers for use herein include methyl vinyl dimethicone, methyl vinyl diphenyl dimethicone and methyl vinyl phenyl methyl diphenyl dimethicone.

Specific commercially available crosslinked polyorganosiloxane polymers for use herein are silicone vinyl crosspolymer mixtures available under the tradename KSG supplied by Shinetsu Chemical Co., Ltd, for example KSG-15, KSG-16, KSG-17, KSG-18. These materials contain a combination of crosslinked polyorganosiloxane polymer and silicone fluid. Particularly preferred for use herein especially in combination with the organic amphiphilic emulsifier material is KSG-18. The assigned INCI names for KSG-15, KSG-16, KSG-17 and KSG-18 are cyclomethicone dimethicone/vinyl dimethicone

crosspolymer, dimethicone dimethicone/vinyl dimethicone crosspolymer, cyclomethicone dimethicone/vinyl dimethicone crosspolymer and phenyl trimethicone dimethicone/phenyl vinyl dimethicone crosspolymer, respectively.

Another class of silicone components suitable for use in a silicone oil phase herein includes polydiorganosiloxane-polyoxyalkylene copolymers containing at least one polydiorganosiloxane segment and at least one polyoxyalkylene segment. Suitable polydiorganosiloxane segments and copolymers thereof are disclosed in WO98/22085. Suitable polydiorganosiloxane-polyalkylene copolymers are available commercially under the tradenames Belsil (RTM) from Wacker-Chemie GmbH, Geschäftsbereich S, Postfach D-8000 Munich 22 and Abil (RTM) from Th. Goldschmidt Ltd., Tego House, Victoria Road, Ruislip, Middlesex, HA4 0YL, for example Belsil (RTM) 6031 and Abil (RTM) B88183. A particularly preferred copolymer fluid blend for use herein includes Dow Corning DC3225C which has the CTFA designation Dimethicone/Dimethicone copolyol.

Amphiphilic Surfactant

A further preferred component of the compositions herein is an organic amphiphilic surfactant which is capable of forming smectic lyotropic crystals in product or when the product is being applied to the skin at ambient or elevated temperatures. The organic amphiphilic surfactant has been found to be especially valuable herein for improving the stability and skin feel of the compositions of the invention. Preferably the compositions herein comprise non-ionic amphiphilic surfactants at a level of from about 0.01 % to about 4%, preferably from about 0.05% to about 3%, and more preferably from about 0.08% to about 2%. Preferred classes of non-ionic amphiphilic surfactants suitable herein and their properties are disclosed in WO98/22085, incorporated herein by reference. Preferred herein are the mono-, di- and tri-acyl sugar esters and mixtures thereof wherein the acyl substituents contain from about 8 to about 24, preferably from about 8 to about 20 carbon atoms and 0,1 or 2 unsaturated moieties and polyethylene glycol derivatives. High preferred herein is a fatty acid ester blend based on a mixture of sorbitan or sorbitol fatty acid ester and sucrose fatty acid ester, the fatty acid in each instance being preferably C_8-C_{24}, more preferably C_{10}-C_{20}. The preferred fatty acid ester emulsifier from the viewpoint of moisturisation is a blend of sorbitan or sorbitol C_{16}-C_{20} fatty acid ester with

sucrose C_{10}-C_{16} fatty acid ester, especially sorbitan stearate and sucrose cocoate. This is commercially available from ICI under the trade name Arlatone 2121.

Humectants

The compositions of the present invention may comprise additional humectants which are preferably present at a level of from about 0.01% to about 20%, more preferably from about 0.1% to about 15% and especially from about 0.5% to about 15%.

Suitable additional humectants useful herein are sodium 2-pyrrolidone-5-carboxylate (NaPCA), guanidine; glycolic acid and glycolate salts (e.g. ammonium and quaternary alkyl ammonium); lactic acid and lactate salts (e.g. ammonium and quaternary alkyl ammonium); aloe vera in any of its variety of forms (e.g., aloe vera gel); hyaluronic acid and derivatives thereof (e.g., salt derivatives such as sodium hyaluronate); lactamide monoethanolamine; acetamide monoethanolamine; urea; panthenol and derivatives thereof; and mixtures thereof.

At least part (up to about 5% by weight of composition) of an additional humectant can be incorporated in the form of an admixture with a particulate cross-linked hydrophobic acrylate or methacrylate copolymer, itself preferably present in an amount of from about 0.1% to about 10%, which can be added either to the aqueous or disperse phase. This copolymer is particularly valuable for reducing shine and controlling oil while helping to provide effective moisturization benefits and is described in further detail by WO96/03964, incorporated herein by reference.

The above listed compounds may be incorporated singly or in combination. Preferred additional humectants are selected from urea, panthenol and mixtures thereof.

Particularly preferred from the viewpoint of boosting moisturisation is a combination of glycerine and urea. In preferred embodiments, urea is preferably present in a level of from about 0.1% to about 20%, more preferably from about 0.5% to about 10% and especially from about 1% to about 5% by weight of composition.

In preferred embodiments, the oil phase and organic amphiphilic surfactant when present are premixed in water at a temperature above the Kraft Point of the organic amphiphilic surfactant (but preferably below about 60°C) to form a liquid crystal/oil in water

dispersion prior to addition of the urea. The urea is found to be especially effective herein in combination with the amphiphilic emulsifier surfactant and the polyol fatty acid polyester for providing outstanding skin moisturisation and softening in the context of an oil-in-water skin care emulsion composition.

A wide variety of optional ingredients such as additional thickening agents, non-occlusive moisturisers, neutralising agents, perfumes, colouring agents and surfactants, can also be added to the skin compositions herein.

Further additional thickeners useful herein are water-soluble glyceryl poly(meth)acrylate lubricants (such as Hispagel®); polyglycerylmethacrylate lubricants available under the trademark Lubrajel (RTM) from Guardian Chemical Corporation, 230 Marcus Blvd., Hauppage, N.Y. 11787, and mixtures thereof. In general, Lubrajels can be described as hydrates or clathrates which are formed by the reaction of sodium glycerate with a methacrylic acid polymer. Thereafter, the hydrate or clathrate is stabilized with a small amount of propylene glycol, followed by controlled hydration of the resulting product. Lubrajels are marketed in a number of grades of varying glycerate: polymer ratio and viscosity. Suitable Lubrajels include Lubrajel TW, Lubrajel CG and Lubrajel MS, Lubrajel WA, Lubrajel DV and so-called Lubrajel Oil.

Optionally, additional cation containing polymers may be added to the compositions herein. Such additional cation containing polymers include an ampholytic polymer. Suitable ampholytic polymers include the copolymer of dimethyldiallyl ammonium chloride and acrylic acid commercially available under the trade designation Polyquaternium-22 or trade name "Merquat 280" from Calgon (Pittsburg, PA, USA); the polymeric quaternary ammonium salt of acrylic acid, diallyl dimethyl ammonium chloride and acrylamide commercially available under the trade designation Polyquaternium-39 or trade name "Merquat Plus 3330" and "Merquat Plus 3331" from Calgon (Pittsburg, PA, USA) and the quaternary ammonium salt formed by the polymerisation of acrylic acid, methyl acrylate and methacrylamidopropyltrimonium chloride commercially available under the trade designation Polyquaternium-47 or trade name "Merquat 2001N" from Calgon (Pittsburg, PA, USA).

A wide variety of optional ingredients such as non-occlusive moisturisers, neutralising agents, perfumes, colouring agents and surfactants, can also be added to the skin compositions herein.

Neutralizing agents suitable for use in neutralizing acidic group containing hydrophilic gelling agents herein include sodium hydroxide, potassium hydroxide, ammonium hydroxide, monoethanolamine, diethanolamine, amino methyl propanol, tris-buffer and triethanolamine.

The compositions of the invention are generally in emulsion form and are preferably formulated so as to have a product viscosity of at least about 4,000 mPa.s and preferably in the range from about 4,000 to about 300,000 mPa.s, more preferably from about 8,000 to about 250,000 mPa.s and especially from about 10,000 to about 200,000 mPa.s and even more especially from about 10,000 to about 150,000 mPa.s ($25^{o}C$, neat, Brookfield RVT, T-C Spindle at 5 rpms and Heliopath Stand).

The compositions of the invention can also contain from about 0.01% to about 10%, preferably from about 0.1% to about 5% of a panthenol moisturizer. The panthenol moisturizer can be selected from D-panthenol ([R]-2,4-dihydroxy-N-[3-hydroxypropyl)]-3,3-dimethylbutamide), DL-panthenol, calcium pantothenate, royal jelly, panthetine, pantotheine, panthenyl ethyl ether, pangamic acid, pyridoxin, pantoyl lactose and Vitamin B complex.

Other optional materials include keratolytic agents/desquamation agents such as salicylic acid; proteins and polypeptides and derivatives thereof; water-soluble or solubilizable preservatives preferably at a level of from about 0.1% to about 5%, such as Germall 115, methyl, ethyl, propyl and butyl esters of hydroxybenzoic acid, benzyl alcohol, EDTA, Euxyl (RTM) K400, Bromopol (2-bromo-2-nitropropane-1,3-diol) and phenoxypropanol; anti-bacterials such as Irgasan (RTM) and phenoxyethanol (preferably at levels of from 0.1% to about 5%); soluble or colloidally-soluble moisturising agents such as hylaronic acid and starch-grafted sodium polyacrylates such as Sanwet (RTM) IM-1000, IM-1500 and IM-2500 available from Celanese Superabsorbent Materials, Portsmith, VA, USA and described in USA-A-4,076,663; vitamins such as vitamin A, vitamin C, vitamin E and derivatives thereof and vitamin K; alpha and beta hydroxyacids; aloe vera; sphingosines

and phytosphingosines, cholesterol; skin whitening agents; N-acetyl cysteine; colouring agents; perfumes and perfume solubilizers.

Also useful herein are sunscreening agents. A wide variety of sunscreening agents are described in U.S. Patent No. 5,087,445, to Haffey et al., issued February 11, 1992; U.S. Patent No. 5,073,372, to Turner et al., issued December 17, 1991; U.S. Patent No. 5,073,371, to Turner et al. issued December 17, 1991; and Segarin, et al., at Chapter VIII, pages 189 et seq., of Cosmetics Science and Technology. Preferred among those sunscreens which are useful in the compositions of the invention are those selected from 2-ethylhexyl p-methoxycinnamate, 2-ethylhexyl N,N-dimethyl-p-aminobenzoate, p-aminobenzoic acid, 2-phenylbenzimidazole-5-sulfonic acid, octocrylene, oxybenzone, homomenthyl salicylate, octyl salicylate, 4,4'-methoxy-t-butyldibenzoylmethane, 4-isopropyl dibenzoylmethane, 3-benzylidene camphor, 3-(4-methylbenzylidene) camphor, titanium dioxide, zinc oxide, silica, iron oxide, Parsol MCX, Eusolex 6300, Octocrylene, Parsol 1789, and mixtures thereof. Still other useful sunscreens are those disclosed in U.S. Patent No. 4,937,370, to Sabatelli, issued June 26, 1990; and U.S. Patent No. 4,999,186, to Sabatelli et al., issued March 12, 1991.

Generally, the sunscreens can comprise from about 0.5% to about 20% of the compositions useful herein. Exact amounts will vary depending upon the sunscreen chosen and the desired Sun Protection Factor (SPF). SPF is a commonly used measure of photoprotection of a sunscreen against erythema. See Federal Register, Vol. 43, No. 166, pp. 38206-38269, August 25, 1978.

The compositions of the present invention can additionally comprise from about 0.1% to about 5% by weight of aluminium starch octenylsuccinate. Aluminium starch octenylsuccinate is the aluminium salt of the reaction product of octenylsuccinic anhydride with starch and is commercially available under the trade name from Dry Flo National Starch & Chemical Ltd. Dry Flo is useful herein from the viewpoint of skin feel and application characteristics.

Other optional materials herein include pigments which, where water-insoluble, contribute to and are included in the total level of oil phase ingredients. Pigments suitable for use in the compositions of the present invention can be organic and/or inorganic. Also

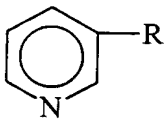
included within the term pigment are materials having a low colour or lustre such as matte finishing agents, and also light scattering agents. Preferably the compositions of the present invention comprise particulate materials having a refractive index of from about 1.3 to about 1.7, the particulate materials being dispersed in the composition and having a median particle size of from about 2 to about 30 μm. Preferably the particulates useful herein have relatively narrow distributions, by which is meant that more than 50% of the particles fall within 3 μm either side of the respective median value. Also preferred is that more than 50%, preferably more than 60%, more preferably more than 70% of particles fall within the size ranges prescribed for the respective median values. Suitable particulate materials are organic or organosilicone and preferably organosilicone polymers. Preferred particles are free-flowing, solid, materials. By "solid" is meant that the particles are not hollow. The void at the centre of hollow particles can have an adverse effect on refractive index and therefore the visual effects of the particles on either skin or the composition. Suitable organic particulate materials include those made of polymethylsilsesquioxane, referenced above, polyamide, polythene, polyacrylonitrile, polyacrylic acid, polymethacrylic acid, polystyrene, polytetrafluoroethylene (PTFE) and poly(vinylidene chloride). Copolymers derived from monomers of the aforementioned materials can also be used. Inorganic materials include silica and boron nitride. Representative commercially available examples of useful particulate materials herein are Tospearl® 145 which has a median particle size of about 4.5 μm and EA-209® from Kobo which is an ethylene / acrylic acid copolymer having a median particle size of about 10 μm, or mixtures thereof.

Further examples of suitable pigments are titanium dioxide, predispersed titanium dioxide from Kobo e.g. Kobo GWL75CAP, iron oxides, acyglutamate iron oxides, ultramarine blue, D&C dyes, carmine, and mixtures thereof. Depending upon the type of composition, a mixture of pigments will normally be used. The preferred pigments for use herein from the viewpoint of moisturisation, skin feel, skin appearance and emulsion compatibility are treated pigments. The pigments can be treated with compounds such as amino acids, silicones, lecithin and ester oils.

Vitamin B_3 component

The compositions of the present invention can also comprise a safe and effective amount of a vitamin B_3 compound. The compositions of the present invention preferably comprise from about 0.01% to about 50%, more preferably from about 0.1% to about 20%, even more preferably from about 0.5% to about 10%, and still more preferably from about 1% to about 8%, most preferably from about 1.5% to about 6%, of the vitamin B_3 compound.

As used herein, "vitamin B_3 compound" means a compound having the formula:



wherein R is - $CONH_2$ (i.e., niacinamide), - COOH (i.e., nicotinic acid) or - CH_2OH (i.e., nicotinyl alcohol); derivatives thereof; and salts of any of the foregoing. Exemplary derivatives of the foregoing vitamin B_3 compounds include nicotinic acid esters, including non-vasodilating esters of nicotinic acid, nicotinyl amino acids, nicotinyl alcohol esters of carboxylic acids, nicotinic acid N-oxide and niacinamide N-oxide.

Suitable esters of nicotinic acid include nicotinic acid esters of C_1-C_{22}, preferably C_1-C_{16}, more preferably C_1-C_6 alcohols. The alcohols are suitably straight-chain or branched chain, cyclic or acyclic, saturated or unsaturated (including aromatic), and substituted or unsubstituted. The esters are preferably non-vasodilating. As used herein, "non-vasodilating" means that the ester does not commonly yield a visible flushing response after application to the skin in the subject compositions (the majority of the general population would not experience a visible flushing response, although such compounds may cause vasodilation not visible to the naked eye). Non-vasodilating esters of nicotinic acid include tocopherol nicotinate and inositol hexanicotinate; tocopherol nicotinate is preferred. A more complete description of vitamin B_3 compounds is given in WO 98/22085.

Examples of the above vitamin B_3 compounds are well known in the art and are commercially available from a number of sources, e.g., the Sigma Chemical Company (St. Louis, MO); ICN Biomedicals, Inc. (Irvin, CA) and Aldrich Chemical Company (Milwaukee, WI). One or more vitamin B_3 compounds may be used herein. Preferred vitamin B_3 compounds are niacinamide and tocopherol nicotinate. Niacinamide is more preferred.

Retinoids

In a preferred embodiment, the compositions of the present invention also contain a retinoid. The vitamin B_3 compound and retinoid provide unexpected benefits in regulating skin condition, especially in therapeutically regulating signs of skin aging, more especially wrinkles, lines, and pores. Without intending to be bound or otherwise limited by theory, it is believed that the vitamin B_3 compound increases the conversion of certain retinoids to trans-retinoic acid, which is believed to be the biologically active form of the retinoid, to provide synergistic regulation of skin condition (namely, increased conversion for retinol, retinol esters, and retinal). In addition, the vitamin B_3 compound unexpectedly mitigates redness, inflammation, dermatitis and the like which may otherwise be associated with topical application of retinoid (often referred to, and hereinafter alternatively referred to as "retinoid dermatitis"). Furthermore, the combined vitamin B_3 compound and retinoid tend to increase the amount and activity of thioredoxin, which tends to increase collagen expression levels via the protein AP-1. Therefore, the present invention enables reduced active levels, and therefore reduced potential for retinoid dermatitis, while retaining significant positive skin conditioning benefits. In addition, higher levels of retinoid may still be used to obtain greater skin conditioning efficacy, without undesirable retinoid dermatitis occurring.

As used herein, "retinoid" includes all natural and/or synthetic analogs of Vitamin A or retinol-like compounds which possess the biological activity of Vitamin A in the skin as well as the geometric isomers and stereoisomers of these compounds. The retinoid is preferably retinol, retinol esters (e.g., C_2 - C_{22} alkyl esters of retinol, including retinyl palmitate, retinyl acetate, retinyl proprionate), retinal, and/or retinoic acid (including all-

trans retinoic acid and/or 13-cis-retinoic acid), more preferably retinoids other than retinoic acid. These compounds are well known in the art and are commercially available from a number of sources, e.g., Sigma Chemical Company (St. Louis, MO), and Boehringer Mannheim (Indianapolis, IN). Preferred retinoids are retinol, retinyl palmitate, retinyl acetate, retinyl proprionate, retinal and combinations thereof. More preferred are retinol and retinyl palmitate. The retinoid may be included as the substantially pure material, or as an extract obtained by suitable physical and/or chemical isolation from natural (e.g., plant) sources.

The compositions preferably contain from or about 0.005% to or about 2%, more preferably 0.01% to about 2% retinoid. Retinol is most preferably used in an amount of from or about 0.01% to or about 0.15%; retinol esters are most preferably used in an amount of from about 0.01% to about 2% (e.g., about 1%).

Suitably, the pH of the compositions herein is greater than 4, preferably greater than 4.25 and more preferably greater than 4.75, also preferably less than 9, more preferably less than 8 and even more preferably less than 7. The water content of the compositions herein is generally from about 30% to about 98.89%, preferably from about 50% to about 95% and especially from about 60% to about 90% by weight.

The compositions of the invention are preferably in the form of a moisturising cream or lotion, which can be applied to the skin as a leave-on product. The invention is illustrated by the following examples.

Examples I to V1

Ingredient	% w/w	% w/w	% w/w	% w/w	% w/w	% w/w
Glycerine	7.00	7.00	9.00	12.00	15.00	-
Polyethylene glycol 200[1]	-	3.00	-	-		10.00
Urea	-	2.20	1.80	-	-	-
Kronos (Ti02)[2]	-	0.15	0.15	-	0.15	0.15
Kobo GWL75CAP[3]	0.50	-	0.20	0.30	-	-

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Tospearl 145a[4]	-	-	0.50	2.00	-	-
Arlatone 2121[5]	1.00	1.00	1.00	1.00	1.00	1.00
Sepigel 305[6]	2.50	1.50	3.00	3.00	2.00	3.00
Sodium Hydroxide (40% soln.)	0.03	0.04	0.05	0.08	0.10	0.10
Hydrofol Acid	0.09	0.10	0.12	0.13	0.10	0.10
Myrj 59[7]	0.10	0.10	0.10	0.10	0.10	0.10
Stearyl Alcohol	0.38	0.40	0.32	0.48	0.80	1.2
Cetyl Alcohol	0.80	1.00	0.72	0.72	1.80	0.80
Isopropyl Isostearate[8]	1.50	0.75	1.50	1.00	0.5	2.00
SEFA Cottonate[9]	1.00	1.50	0.75	1.80	-	-
Isohexadecane	1.00	-	-	-	0.50	1.00
Petrolatum	-	-	-	-	1.20	0.50
Ethyl paraben	0.10	0.15	0.15	0.20	0.20	0.25
Propyl paraben	0.15	0.20	0.25	0.30	0.25	0.25
Benzyl alcohol	0.15	0.20	0.20	0.25	0.25	0.30
D-Panthenol	0.50	-	-	-	0.50	1.00
Niacinamide	2.00	-	-	-	2.00	5.00
Di-sodium EDTA	0.10	0.10	0.10	0.10	0.10	0.10
DC Q2-1403[10]	1.60	1.60	1.80	1.50	2.00	2.50
Tocopherol acetate	0.50	0.25	0.25	0.75	0.50	-
Polyquaternium 10[11]	0.15	0.20	0.25	0.30	0.50	0.50
N-Hance 2196[12]	-	0.20	0.25	0.30	0.50	0.50
Deionised Water	to 100	to 100	to 100	to 100	to 100	to 100

1. Supplied by Union Carbide Corporation, Danbury, Conn., USA

2. Supplied by Kronos, 4 Place Ville Marie # 500, Montreal, Quebec, Canada

3. Supplied by Kobo Products Inc, 690 Montrose Ave, So Plainfield, NJ 07080

4. Supplied by GE Silicones, Plasticslaan 1/PO Box 117, 4600 AC Bergen op Zoom, Netherlands

5. Supplied by ICI Surfactants, PO Box 90, Wilton Centre, Middlesborough, Cleveland, England. TS6 8JE

6. Supplied by Seppic, 75 Quai D'Orsay, Paris

7. PEG 100 Stearate supplied by ICI, PO Box 90, Wilton Centre, Middlesborough, Cleveland, England. TS6 8JE

8. Supplied by Scher Chemicals Inc, Industrial West, Clifton, NJ 07012

9. A C1-C30 monoester or polyester of sugars and one or more carboxylic acid moieties as described herein, preferably a sucrose polyester in which the degree of esterification is 7-8, and in which the fatty acid moieties are C18 mono- and/or di-unsaturated and behenic, in a molar ratio of unsaturates:behenic of 1:7 to 3:5, more preferably the octaester of sucrose in which there are about 7 behenic fatty acid moieties and about 1 oleic acid moiety in the molecule, e.g., sucrose ester of cottonseed oil fatty acids.

10. Supplied by Dow Corning, Kings Court, 185 Kinds Rd, Reading, Berks, RG1 4EX

11. Supplied by Union Carbide Corporation, Danbury, Conn., USA

12. Supplied by Aqualon (Hercules Inc), Noordweg 9, 3336 LH Zwinjndrecht, P.O Box 71, 3330 AB Zwijndrecht, The Netherlands

The compositions are made as follows:

A first premix of anionic thickening agents (if present), glycerine/TiO2 premix, cation containing polymer, Arlatone 2121 when present, and other water soluble ingredients apart from urea, is prepared by admixing in water and heating to about 80°C. A second premix of the oil phase ingredients including the emulsifiers, oil-soluble preservatives, other than silicone oil is prepared by mixing and heating and is added to the aqueous premix.

If polymeric anionic thickener is present, sodium hydroxide is then added to neutralise to pH 6-7.5 before shearing and cooling to about 60°C. In the presence of polymeric non-ionic thickeners, the process is as described above but the polymeric thickener e.g. Sepigel 305 (polyacrylamide) is not added until the mixture is cooled to 60°C. The Sepigel 305 is added under shear and then the NaOH solution added. In both cases, EDTA, silicone oil, and then urea solution (1g dissolved in 1ml of water) are then added to the resulting oil-in-water emulsion and the mixture is cooled before adding minor ingredients. The composition is ready for packaging.

The compositions display high moisturisation efficacy without the associated high levels of tack, as well as good rheological, absorption and insulation properties, in addition to skin feel, skin softness and skin smoothness benefits.